

COAXIAL CONNECTOR AND METHOD

Technical Field

The present invention relates generally to a connector for coaxial cables and more particularly to a simplified coaxial connector and method of attachment of a cable to the coaxial connector.

Background of the Invention

Current connectors on the market consist of a number of moving parts, typically a standard front end which consists of an inner terminal, an outer terminal, insulator and a moveable back nut which encapsulates a number of seals, retaining rings and the like. U.S. Patent No. 6,133,532 shows one such connector, having a back nut which encapsulates three different moving parts (a locking device, guide surface and inner sleeve) as well as three separate O-ring seals. The large number of moving parts in the back nut portion complicates the fitting of a coaxial cable which usually requires the use of several specialized tools. Additionally, the risk of connector malfunctioning and mounting problems increases with a higher number of moving parts, since there is a greater chance that at least one part may be defective, missing or incorrectly attached.

Furthermore, due to the large number of moving parts encapsulated in the back nut of most conventional connectors, the outer conductor must be thoroughly cleared of all glue and adhesive material that may hinder or jam the parts during mounting and tightening, or a poor electrical connection may result. This process can prove to be quite difficult and time-consuming.

The manufacture and assembly of conventional connectors is also expensive in terms of time taken and material costs due to the number of parts enclosed in the back nut, which have to be manufactured and assembled.

1 Accordingly, it is an object of the present invention is to provide a simple, yet effective
2 method of securely connecting a coaxial cable with either a corrugated or non-corrugated outer
3 conductor to a coaxial connector.

4 A further object of the invention is to provide an economic and effective connector for
5 coaxial cables.

6 A further object is to provide a connector having a simple design and a limited number
7 of parts, thus reducing manufacturing expense and assembly time.

8 These and other objects of the present invention will become more apparent to those
9 skilled in the art as the description of the present invention proceeds.

11 Summary of the Invention

12 The present invention provides a connector consisting of a back nut, inner and outer
13 terminals, and insulator. The back nut is made of a single tubular piece and does not enclose
14 any further parts. In connecting a coaxial cable to the connector, the cable is inserted through
15 the back nut, and a portion of the conductor at the cable's end is flared and shaped along the
16 back nut. The back nut is then axially displaced to clamp the cable between an outer terminal of
17 the connector and the back nut. This process is very simple and easy to carry out, while greatly
18 reducing the chances of errors and defects in assembly and mounting in comparison to
19 convention connectors.

20 The reduction in the number of parts also means that only an end portion of the outer
21 conductor which comes into contact with the connector has to be stripped of glue and adhesive
22 material. This is a much smaller area than required for conventional conductors.

23 According to one embodiment, the procedure for mount the connector to the cable
24 includes the steps of a) removing the insulating jacket from the end of the cable which is to be
25 connected; b) removing the dielectric material from the end of the cable to be connected; c)
26 inserting the cable through the back nut; d) stripping any adhesive material from the portion of
27 the cable's outer conductor; e) shaping the cable's outer conductor to conform to the back nut's
28 inside circumference; f) placing the outer conductor's stripped end portion in a gap formed

1 between the outer terminal's contact face and the back nut's abutting face; and g) longitudinally
2 displacing the back nut in relation to the connector's front end until the end portion of the cables
3 outer conductor is clamped between the corresponding faces of the connector outer terminal and
4 back nut.

5 6 Brief Description of the Drawings

7 Figure 1 is a sectional view of a connector, according to a preferred embodiment of the
8 present invention.

9 Figure 2 is a sectional view of the connector of Figure 1 mounted to a cable.

10 Figure 3 is a view similar to Figure 2, enlarged to show the attachment between an outer
11 conductor portion of the cable and connector.

12 13 Detailed Description of the Invention

14 Figure 1 illustrates an embodiment of a connector 10 having an outer terminal 4,
15 insulator 2 and inner terminal 1, which are rigidly attached to one another, and a back nut 3,
16 which is rotatable and longitudinally displaceable along outer terminal 4, via mating threads 21.
17 The inner terminal, back nut, and outer terminal are preferably made of brass. Other suitable
18 materials include bronze for the inner terminal and plastic for the back nut. The insulator is
19 press fit around the inner terminal and press fit into the outer terminal.

20 Figure 2 illustrates connector 10 mounted to an end 19 of a cable 5, which includes inner
21 and outer conductors 11 and 12, respectively, separated by a dielectric 13 and an outer insulating
22 jacket 14. Outer conductor 12 is rigid, and may either be corrugated or smooth. An air space 18
23 is created between outer surfaces of the inner terminal and insulator, and inner surface of the
24 outer terminal, and the end of the cable. This air space minimizes the loss through the
25 connector at the connection between the connector and the cable, and provides about one-third
26 the loss obtained with connectors having a corresponding dielectric filling.

27 In preparing cable 5 for mounting, a portion of the insulating jacket is removed from the
28 end of the cable to expose a portion 7 of the outer conductor. A portion of the dielectric is then

1 removed to expose a portion 15 of the cable's inner conductor. Also, the exposed outer
2 conductor portion 7 is stripped and cleaned of any adhesive material that may have been used to
3 secure the jacket about the outer conductor.

4 Connector 10 is shown with inner conductor portion 15 mounted and in contact with
5 inner terminal 1, while the cable's stripped and cleaned outer conductor portion 7 is positioned
6 in a gap 16 formed between abutting faces, 8 and 9, respectively, of the outer terminal 4 and the
7 back nut 3, respectively. The cable receiving portion of the back nut, corresponding to face 9 is
8 solid, not containing any slots or holes, in order to form a complete seal and make complete
9 contact with the cable. The outer conductor portion 7 has been flared outwardly to create an
10 enlarged-diameter lip after the exposed end of the cable has been inserted through the central
11 aperture of the back nut. Outward flaring of the outer conductor may be produced by using a
12 flaring tool for enlarging the diameter of the exposed end of the outer conductor. This flared
13 end, or enlarged-diameter lip stops back nut 3 from slipping off the end of cable 5 and enables
14 outer conductor portion 7 to be clamped in gap 16, as shown in the figure. The length of the
15 flared portion of the outer conductor is preferably less than the diameter of the cable, and more
16 preferably, less than half the diameter of the cable; ideally, the length of the flared portion is less
17 than one-fourth the diameter of the cable. An O-ring 6 is located within an annular groove in
18 the back nut. When back nut 3 is threaded over outer terminal 4, O-ring 6 is compressed
19 between faces 8 and 9 to ensure that moisture does not enter between outer terminal 4 and back
20 nut 3; moisture ingress often interferes with reliable electrical contact within the connector.

21 Figure 3 is an enlarged view of the connection between the outer terminal 4 and back nut
22 3 (for clarity, O-ring 6 is not shown). As shown in Fig. 3, the end portion of outer conductor 12
23 is stripped of its jacket 14. As is also shown in Fig. 3, a portion of the dielectric material inside
24 the coaxial cable has been removed to expose the inner surface of the outer conductor. As
25 shown in Fig. 3, the end of outer conductor 12 has been flared to ensure that it may be inserted
26 into the gap between corresponding faces 8 and 9. Fig. 3 shows end portion 7 of the outer
27 conductor clamped between the back nut 3 and outer terminal 4, more specifically, between
28 corresponding faces 8 and 9, ensuring a good mechanical connection, as well as a good

1 electrical connection with the outer terminal's contact face 8. End portion 7 is compressed
2 between back nut 3 and outer terminal 4 along the faces 8 and 9, which are angled, as shown in
3 Fig. 3, such that the longitudinal displacement of the back nut toward the outer terminal
4 (resulting from the tightening of back nut 3 over outer terminal 4) causes the outer conductor to
5 be clamped. The frontmost portion of back nut 3 has internal threads formed therein; a
6 corresponding portion of the outer terminal 4 has external threads formed thereupon for mating
7 with the aforementioned internal threads of back nut 3.

8 Cable 5 is mounted as follows: first, the cable jacket 14 and dielectric material 13 is
9 stripped off of the end of the cable to be connected. The cable is then inserted through the
10 central aperture of back nut 3. The exposed end of outer conductor portion 7 is then flared
11 outwardly to a diameter which exceeds the smallest inner diameter of back nut 3, using the
12 flaring tool described above. Any adhesive or glue remaining on the flared end of outer
13 conductor portion 7 is removed. The end 19 of inner conductor 15 of the coaxial cable is then
14 inserted into inner terminal 1 of the connector, while simultaneously bringing flared outer
15 conductor portion 7 into proximity with face 8 of outer terminal 4. Back nut 3 is then
16 threadedly engaged over outer terminal 4 and screwed until there is a mechanical stop. The
17 connector is now reliably secured to the end of the coaxial cable.

18 According to a second embodiment, the cable may be mounted without removing either
19 the cable's jacket or dielectric. The steps for mounting, according to this method, are as
20 follows: first, an end portion of the cable is inserted through back nut 3. A tool is then used to
21 pry the end portion of the cable's outer conductor away from the dielectric and flare it
22 outwardly, as mentioned above. The inner conductor of the coaxial cable is then inserted into
23 inner terminal 1 of the connector as described above, and back nut 3 is screwed over outer
24 terminal 4 until there is a mechanical stop, leaving the end portion of the cable securely clamped
25 between faces 8 and 9 of the outer terminal 4 and back nut 3. The cable can be mounted
26 according to this method as long as there is a sufficient contact between the outer conductor
27 portion 7 and face 8 of outer terminal 4.

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1 According to a third embodiment, the cable is mounted by removing the dielectric within
2 the exposed end of the coaxial cable, but not the cable jacket. This is a combination of the two
3 previous embodiments. The steps for mounting the cable are as follows: first, a sufficient
4 amount of dielectric material is removed from the end portion of the cable. The exposed end of
5 the coaxial cable is then inserted through the central aperture of back nut 3. The end of outer
6 conductor portion 7 is again flared outwardly. The inner conductor 15 of the coaxial cable is
7 then inserted into inner terminal 1 of the connector, as described above. The back nut 3 is then
8 longitudinally displaced, as by screwing back nut 3 onto outer terminal 4, so that the flared outer
9 conductor and adjoined insulating jacket are clamped securely between the outer terminal's
10 contact face 8 and the abutting back nut face 9.

11 Those skilled in the art will note that the above-described connector is of extremely
12 simple design and requires a minimal number of components. It will also be noted that the outer
13 conductor of the coaxial cable is directly clamped between the outer terminal and back nut of
14 the coaxial connector, without requiring additional clamp rings, collars or other like
15 components. As a result of its simple design, the disclosed connector can be manufactured
16 relatively inexpensively and may be installed to the end of a coaxial cable relatively quickly and
17 reliably.

18 While the present invention has been described with respect to a preferred embodiment
19 thereof, such description is for illustrative purposes only, and is not to be construed as limiting
20 the scope of the invention. Various modifications and changes may be made to the described
21 embodiment by those skilled in the art without departing from the true spirit and scope of the
22 invention.